The AstroNet: A Human-Centric Network of Free-Flying Space Co-Robots

Completed Technology Project (2016 - 2020)

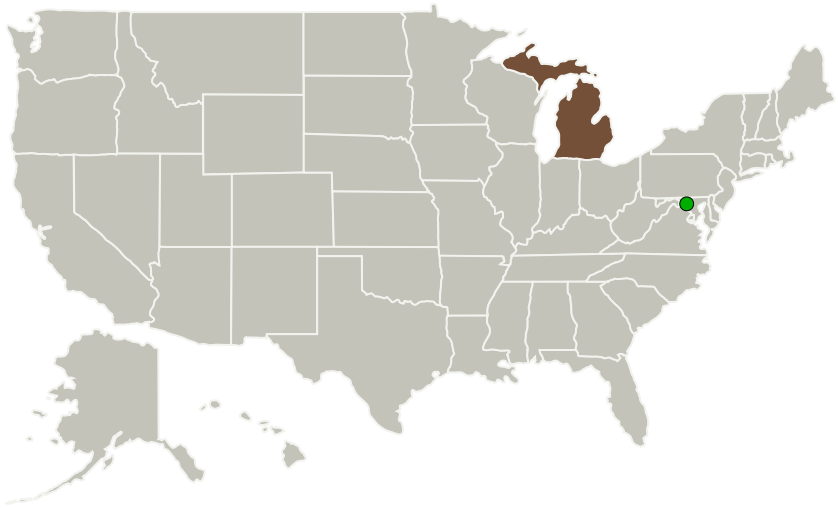
Project Introduction

NASA has long been concerned with the potential for micrometeoroid and orbital debris impacts to compromise the structural integrity of manned spacecraft. Visual inspection of spacecraft exteriors by crew members has been the preferred method of finding and assessing hull damage. In this proposal we aim at ultimately making the inspection and maintenance processes less time consuming and overall easier for the astronaut, and we introduce the AstroNet: A Network of Astronautical Free-Flying Co-Robots to interact with the crew members and assist them in their Extra-Vehicular Activities (EVAs) such as inspection, maintenance and repair of spacecraft exteriors. The Astronet is envisioned to: (i) safely surround the crew member during EVAs, (ii) perceive simple human commands (e.g., gestures) and interpret them into predefined tasks, (iii) respond to human commands by redistributing autonomously in space to dynamically and continuously improve task conditions (e.g., visualize areas beyond the line-of-sight of the astronaut, shed light, bring tools) in a human-centric way.

Anticipated Benefits

Benefits of this technology include making extravehicular activities such as inspection, maintenance, and repair processes less time consuming and overall easier for astronauts.

Primary U.S. Work Locations and Key Partners



The AstroNet: A Human-Centric Network of Free-Flying Space Co-Robots

Table of Contents

The AstroNet: A Human-Centric Network of Free-Flying Space Co-Robots

Completed Technology Project (2016 - 2020)

Organizations Performing Work	Role	Type	Location
University of Michigan-Ann Arbor	Lead Organization	Academia	Ann Arbor, Michigan
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations
Michigan

Project Website:

https://www.nasa.gov/strg#.VQb6T0jJzyE

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

University of Michigan-Ann Arbor

Responsible Program:

Space Technology Research Grants

Project Management

Program Director:

Claudia M Meyer

Program Manager:

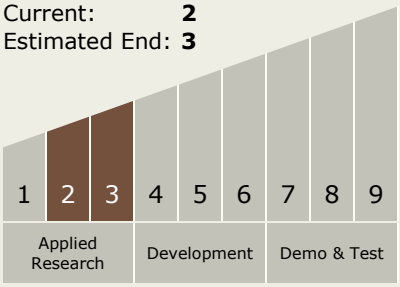
Hung D Nguyen

Principal Investigator:

Dimitra Panagou

Technology Maturity (TRL)

Start: **2**
Current: **2**
Estimated End: **3**



The AstroNet: A Human-Centric Network of Free-Flying Space Co-Robots

Completed Technology Project (2016 - 2020)

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.6 Human Systems Integration
    - TX06.6.1 Human Factors Engineering

Target Destinations

The Moon, Earth